
Genomic maps of long noncoding RNA occupancy reveal principles of RNA-chromatin interactions.

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Public Summary:

Long noncoding RNAs (lncRNAs) are key regulators of chromatin state, yet the nature and sites of RNA-chromatin interaction are mostly unknown. Here we introduce Chromatin Isolation by RNA Purification (ChIRP), where tiling oligonucleotides retrieve specific lncRNAs with bound protein and DNA sequences, which are enumerated by deep sequencing. ChIRP-seq of three lncRNAs reveal that RNA occupancy sites in the genome are focal, sequence-specific, and numerous. *Drosophila* roX2 RNA occupies male X-linked gene bodies with increasing tendency toward the 3' end, peaking at CES sites. Human telomerase RNA TERC occupies telomeres and Wnt pathway genes. HOTAIR lncRNA preferentially occupies a GA-rich DNA motif to nucleate broad domains of Polycomb occupancy and histone H3 lysine 27 trimethylation. HOTAIR occupancy occurs independently of EZH2, suggesting the order of RNA guidance of Polycomb occupancy. ChIRP-seq is generally applicable to illuminate the intersection of RNA and chromatin with newfound precision genome wide.

Scientific Abstract:

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